LAW OFFICES
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, DC 20037-3213
TELEPHONE (202) 293-7060
FACSIMILE (202) 293-7860

October 29, 1999

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Re: Application of **Claire BESSET-BATHIAS**

A METHOD FOR GENERATING ATM CELLS FOR LOW BIT RATE APPLICATIONS
Our Ref. Q56456

Dear Sir:

Attached hereto is the application identified above including 11 sheets of the specification, claims and abstract, 1 sheet of formal drawings, executed Assignment and PTO 1595 form, and executed Declaration and Power of Attorney.

Please see attached preliminary amendment before calculating Government filing fee.

The Government filing fee is calculated as follows:

Total claims	13	- 20	= 0	x	$18.00	=	$.00
Independent claims	1	- 3	= 0	x	$78.00	=	$.00
Base Fee							$760.00
TOTAL FILING FEE							**$760.00**
Recordation of Assignment							$40.00
TOTAL FEE							**$800.00**

Checks for the statutory filing fee of $760.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. § 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from June 30, 1999 based on European Application No. 99401628.5. The priority documents are enclosed herewith.

Respectfully submitted,
SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
Attorneys for Applicant

By: David J. Cushing
David J. Cushing
Registration No. 28,703

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Claire BESSET-BATHIAS — Attorney Docket Q56456

Appln. No.: Not yet assigned — Group Art Unit: Not yet assigned

Filed: October 29, 1999 — Examiner: Not yet assigned

For: A METHOD FOR GENERATING ATM CELLS FOR LOW BIT RATE APPLICATIONS

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE CLAIMS:

Claim 11, line 2, delete "any of claims 1 to 10".

IN THE ABSTRACT:

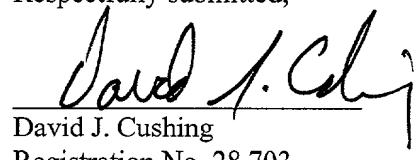
After the heading, delete the title in its entirety.

After the abstract, delete "Figure to be published: Fig. 1"

REMARKS

Entry and consideration of this Amendment is respectfully requested.

Respectfully submitted,



David J. Cushing
Registration No. 28,703

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860
Date: October 29, 1999

A METHOD FOR GENERATING ATM CELLS FOR LOW BIT RATE APPLICATIONS

Backgroud of the Invention

The present invention is generally concerned with telecommunication systems.

The present invention is more particularly concerned with telecommunication systems using ATM (Asynchronous Transfer Mode). ATM is a commonly used standard for transmission of high bit rate data in telecommunication systems, which is based on an asynchronous time multiplexing of packets of fixed length called cells.

Telecommunication systems using ATM may be modelized by an ATM layer and an interface layer, or ATM Adaptation Layer (AAL), between the ATM layer and users.

A specific ATM Adaptation Layer has been provided for low bit rate applications such as in particular mobile communication systems, especially third generation mobile communication systems (such as in particular UMTS : "Universal Mobile telecommunication System").

Such a specific layer, or AAL2, is defined in ITU-T Recommendation I.363.2. AAL2 is subdivided into a Service Specific Convergence Sublayer (SSCS) and a Common Part Sublayer (CPS) which allows several low bit rate connections to share a same ATM connection, by multiplexing several short packets called CPS packets into a same ATM cell.

To be efficient, the process carried out at CPS level should simultaneously achieve a number of objectives, in particular:

- this process should be bandwidth efficient, i.e. ATM cells should be sent with as least padding as possible,
- this process should meet quality of service requirements, in particular it should introduce as least delay variations as possible,
- this process should meet different quality of service requirements for the different types of traffic to be multiplexed ; in particular voice traffic is time sensitive and requires stringent delay variations objectives, while data or signalling traffic are usually tolerant to transfer delay variations.

A currently used solution is the following. If an ATM cell is complete with CPS packets before the expiration of a timer delay, it is sent out immediately; otherwise it

is sent out (completed with padding) as soon as this timer delay expires. In other words, this solution ensures that CPS packets wait at most the duration of the timer before being scheduled for transmission.

Though this solution reduces the waiting time of CPS packets, it still has the drawback of introducing some delay variations.

The present invention is based on a different approach, enabling in particular to avoid such a drawback.

Summary of the Invention

An object of the present invention is therefore a method for generating ATM cells for low bit rate applications, said method including a step of scheduling ATM cell transmission times in a way as to keep ATM cell spacing as constant as possible, and a step of multiplexing a plurality of low bit rate connections into a same ATM connection having the thus scheduled ATM cell transmission times.

According to another object of this invention, said ATM cell spacing is kept as close as possible to a cell rate negociated for the corresponding ATM connection.

Cell rate is a currently known parameter of a traffic agreement negociated for data transfer in ATM networks. Control of compliance with the negociated cell rate is usually performed in transit nodes of an ATM network, by compensating for cell delay variations occuring during transit in this network. On the contrary, the present invention is carried out in a source node. Indeed, the present invention is concerned with a mode of generation of ATM cells which may , in itself, introduce cell delay variations. Ensuring compliance with the negociated cell rate, as from the source, therefore constitutes a simple and efficient way of avoiding such delay variations, while at the same time simplifying traffic management in the network.

Depending on the type of traffic agreement for the ATM connection, and according to various embodiments of the present invention, cell rate may be:

- a PCR (Peak Cell Rate) in the case of service category of DBR (Deterministic Bit Rate) or CBR (Constant Bit Rate) type,
- a BCR (Block Cell Rate) in the case of service category of ABT (ATM Block Transfer) type,
- a ACR (Allowed Cell Rate) in the case of service category of ABR (Available Bit Rate) type.

According to another embodiment, said negociated cell rate may be re-negociated, to optimise resource utilisation in the network.

According to another object of this invention, no ATM cell is sent when there is no data available from any of said low bit rate connections, and said method includes a step of referencing said scheduling of ATM cell transmission times with respect to the next availability of data from at least one of said low bit rate connections.

According to another object of this invention, said low bit rate connections are assigned different priorities, and said multiplexing step includes an intra-priority multiplexing for multiplexing low bit rate connections of same priority, and an inter-priority multiplexing for multiplexing low bit rate connections of different priorities.

According to a first embodiment of the present invention, said intra-priority multiplexing and said inter-priority multiplexing are both carried out at ATM Adaptation Layer (AAL) level.

According to a second embodiment of the present invention, said intra-priority multiplexing is carried out at ATM Adaptation Layer (AAL) level and said inter-priority multiplexing is carried out at ATM Layer level.

Another object of the present invention is a device for generating ATM cells for low bit rate applications, said device including means for scheduling ATM cell transmission times in a way as to keep ATM cell spacing as constant as possible, and means for multiplexing a plurality of low bit rate connections into a same ATM connection having the thus scheduled ATM cell transmission times.

The present invention also has for its object an entity such as a base station (or Node B in UMTS) of a mobile radiocommunication network, comprising such a device.

The present invention also has for its object an entity such as a base station controller (or Radio Network Controller or RNC in UMTS) of a mobile radiocommunication network, comprising such a device.

Brief Description of the Drawings

These and other objects of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawings:

- figure 1is a diagram intended to illustrate a first embodiment of a method according to the present invention,

- figure 2 is a diagram intended to illustrate a second embodiment of a method according to the present invention.

More Detailed Description of the Invention

As an example, this description will be made for the case of different quality of service requirements, i.e. different priorities, for the different types of low bit rate connections (or AAL2 connections) to be multiplexed onto the same ATM connection.

Still as an example, this description corresponds to the case of two streams of CPS packets to be multiplexed into a same ATM connection, one corresponding to real time, or high priority, traffic (for example speech traffic) and the other one corresponding to non real time, or low priority, traffic (such as for example data traffic or signalling). In the following, index 0 will be used for high priority traffic, and index 1 will be used for low priority traffic.

It should however be noted that the present invention is not limited to such examples, and other examples may be derived from the following description.

The first embodiment of the present invention, illustrated in figure 1, corresponds to the case where both inter-priority and intra-priority multiplexing are carried out at ATM Adaptation Layer (AAL) level.

The following notations will be used hereinafter:

- T: ATM emission interval (or ATM cell rate)
- AST: ATM Scheduling Time (or ATM cell scheduled transmission time)
- LL_0: linked list of high priority (contains all the addresses of high priority CPS packets competing for packing into ATM cells)
- LL_1: linked list of low priority of re-emission (contains all the addresses of low priority CPS packets competing for packing into ATM cells)
- SLI_i: Sum of Length Indicators (or sum of the lengths of all CPS packets of linked list LL_i)

As illustrated in figure 1, when a CPS packet, such as the ones illustrated at CPS_0 or CPS_1, arrives, it is stored in a common buffer noted CB, as illustrated at 1_0 or 1_1.

Besides, as illustrated at 2_0 or 2_1, a pointer to this CPS packet (or address, noted @, of this CPS packet in the common buffer CB) is inserted in a corresponding FIFO memory, or linked list, LL_0 or LL_1.

Besides, a new value of SL_i is determined, in computation means noted 3, using the following relation:

$$SLi = SLi + LIi$$

where LIi is the length of the received CPS packet (indicated by a corresponding field of CPS packets).

Let AST be a current ATM cell scheduled transmission time.

At each scheduled cell transmission time AST , linked lists LL_0 and LL_1 are served according to their respective priority and an ATM cell is filled accordingly. In other words, every ATM cell scheduled transmission time:

- If $SLI_0 \geq 47$ octets (i.e. if $SLI_0 \geq$ number of octets of an ATM cell payload), the addresses in the common buffer of the first received 47 octets of high priority are read in linked list LL_0 , the common buffer CB is "emptied" from these 47 first octets, SLI_0 is set to $SLI_0 - 47$, and these octets are mapped into an ATM cell (no padding in this case).
- If $SLI_0 < 47$ octets (with $SLI_0 = x$), the addresses in the common buffer of the "x " first received octets of high priority are read in linked list LL_0 , the common buffer CB is "emptied" from these "x" octets, and SLI_0 is set to $SLI_0 = 0$. Then:
  - If $SLI_1 = 0$, i.e. if there are no low priority packets to fill the cell, these "x" octets are mapped into the ATM cell and padding is used in this case to fill the cell,
  - If $SLI_1 > 0$ and $SLI_1 \geq 47\text{-}x$, the addresses in the common buffer of the first 47-x received octets of low priority are read in linked list LL_1 , the common buffer CB is "emptied" from these octets, SLI_1 is set to $SLI_1 = SLI_1\text{-}(47\text{-}x)$, and these "x" and 47-x octets are mapped into the ATM cell (no padding in this case)
  - If $SLI_1 > 0$ and $SLI_1 < 47\text{-}x$ (with $SLI_1 = y$), the common buffer is emptied from the corresponding "y" octets, SLI_1 is set to 0, and these "x" and "y" octets are mapped into the ATM cell (padding is used in this case to fill the cell).

If a partial CPS packet of low priority is sent, the address of this CPS packet is linked in the high priority linked list (it must be the first packet to be sent in the next ATM cell).

This process is performed at each scheduled ATM cell transmission time by multiplexing means noted 8 which are schematically illustrated as mapping the selected octets into ATM cells such as ATM_n , as shown at 4_0 or 4_1. An ATM cell such as for example ATM_n is currently composed of a header field, noted H, a so-called STF field, and CPS packets such as CPS_0 , CPS_1 in this example. Besides, at each scheduled ATM cell transmission time AST, if after this process the two linked lists LL_0 and LL_1 are empty, i.e. if no CPS packet is available for transmission in ATM cells, no new AST is scheduled, i.e. no new ATM cell is sent. Otherwise, if at least one of the two lists is not empty, a new AST is scheduled. Generally this new AST is determined so as to keep the ATM cell spacing as constant as possible. Advantageously AST may be computed using the following relation:

$$AST = AST + T$$

where T is the cell rate negociated for the corresponding ATM connection.

As already indicated, ensuring compliance with the negociated cell rate constitutes a simple and efficient way of avoiding delay variations, while at the same time simplifying traffic management in the network.

Besides, depending on the type of traffic agreement for the ATM connection, and according to various embodiments of the present invention, cell rate may be:

- a PCR (Peak Cell Rate) in the case of service category of DBR (Deterministic Bit Rate) or CBR (Constant Bit Rate) type,
- a BCR (Block Cell Rate) in the case of service category of ABT (ATM Block Transfer) type,
- a ACR (Allowed Cell Rate) in the case of service category of ABR (Available Bit Rate) type.

Besides, cell rate may be re-negociated to optimize resource utilisation in the network; in other words ATM cell spacing may be dynamically determined.

In particular, cell rate of the ATM connection may be re-negociated:

- at set up or release of an AAL2 connection,
- when the utilisation of the ATM connection goes over a given threshold (upper re-negociation), or under a given threshold (lower re-negociation),
- every transmission time interval, as a function of the total AAL2 traffic to be conveyed.

Besides, in the case where a new CPS packet arrives at a time "t" where both linked lists LL_0 and LL_1 are empty, i.e. in the case of a next availability of a CPS packet for transmission in ATM cells, further to a period of non availabilty, AST may be computed in the following way:

- if $AST + T \leq t$, $AST = t$
- if $AST + T > t$, $AST = AST + T$

In other words, $AST = t$ may be considered as serving as a new reference for the computation of a new AST according to relation $AST = AST + T$ used otherwise.

Computation means such as for example the computation means 3 may be used for scheduling the ATM cell transmission times according to such a method.

The second embodiment of the present invention, illustrated in figure 2, corresponds to the case where said said intra priority multiplexing is carried out at ATM Adaptation Layer (AAL) level, and said inter-priority multiplexing is carried out at ATM Layer level.

The method illustrated in figure 2 thus differs from the one illustrated in figure 1 in that two types of ATM cells are created by intra-priority multiplexing (i.e. by multiplexing of CPS packets of the same priority) ,each type corresponding to a type of traffic priority, and these two types of ATM cells are multiplexed into an ATM connection at ATM layer level. A first type of ATM cells, such as the one noted ATM_{n0} in figure 2, corresponds to high priority traffic, and a second type of ATM cells, such as the one noted ATM_{n1} in figure 2, corresponds to low priority traffic.

The formation of each of these two types of ATM cells uses queuing means, respectively 5_0 , 5_1 and multiplexing means that do not apply any traffic priority criteria, respectively 9_0, 9_1 .

ATM cell transmission times for each of these two types of cells are scheduled according to the same principle than disclosed above, i.e. in a way as to keep ATM cell spacing as constant as possible, preferably as close as possible to a cell rate negociated for the ATM connection. Though not illustrated in detail, this may be derived from the embodiment of figure 1, by considering the case of one type of traffic only.

Multiplexing of such ATM cells at the ATM layer level uses queuing means 6_0, 6_1 and multiplexing means 7 that do apply traffic priority criteria.

A method or a device for generating ATM cells for low bit rate applications may in particular be used in mobile communication systems, in particular :

- in a base station, or Node B in UMTS, for multiplexing low bit rate traffic from a plurality of sources into a same ATM connection, for transmission to a base station controller,
- in a base station controller, or Radio Network Controller (RNC) in UMTS, for multiplexing low bit rate traffic from a plurality of sources into a same ATM connection, for transmission to a base station .

CLAIMS

1. A method for generating ATM cells for low bit rate applications, said method including a step of scheduling ATM cell transmission times in a way as to keep ATM cell spacing as constant as possible, and a step of multiplexing a plurality of low bit rate connections into a same ATM connection having the thus scheduled ATM cell transmission times.

2. A method according to claim 1, wherein said ATM cell spacing is kept as close as possible to a cell rate negociated for the corresponding ATM connection.

3. A method according to claim 2, wherein said cell rate is a Peak Cell Rate PCR in the case of service category of DBR, or Deterministic Bit Rate, or CBR, or Constant bit Rate, type.

4. A method according to claim 2, wherein said cell rate is a Block Cell Rate BCR in the case of service category of ABT, or ATM Block Transfer, type.

5. A method according to claim 2, wherein said cell rate is an Allowed Cell Rate ACR in the case of service category of ABR, or Available Bit Rate, type.

6. A method according to claim 2, wherein said cell rate may be re- negociated.

7. A method according to claim 1, wherein no ATM cell is sent when there is no data available from any of said low bit rate connections, and said method includes a further step of referencing said scheduling step with respect to the next availability of data from at least one of said low bit rate connections.

8. A method according to claim 1, wherein said low bit rate connections are assigned different priorities, and said multiplexing step includes an intra-priority multiplexing for multiplexing low bit rate connections of the same priority, and an inter-priority multiplexing for multiplexing low bit rate connections of different priorities.

9. A method according to claim 8, wherein said intra-priority multiplexing and said inter-priority multiplexing are both carried out at ATM Adaptation Layer level.

10. A method according to claim 8, wherein said intra-priority multiplexing is carried out at ATM Adaptation Layer level, and said inter-priority multiplexing is carried out at ATM layer level.

11. A device for generating ATM cells for low bit rate applications, said device including, for performing a method according to any of claims 1 to 10, means for scheduling ATM cell transmission times in a way as to keep ATM cell spacing as constant as possible, and means for multiplexing a plurality of low

bit rate connections into a same ATM connection having the thus scheduled ATM cell transmission times.

12. A base station for a mobile radiocommunication network, comprising a device according to claim 11 for multiplexing low bit rate traffic from a plurality of sources into a same ATM connection, for transmission to a base station controller.

13. A base station controller for a mobile radiocommunication network, comprising a device according to claim 11 for multiplexing low bit rate traffic from a plurality of sources into a same ATM connection, for transmission to a base station.

ABSTRACT

A METHOD FOR GENERATING ATM CELLS FOR LOW BIT RATE APPLICATIONS

A method for generating ATM cells for low bit rate applications, said method including a step of scheduling ATM cell transmission times in a way as to keep ATM cell spacing as constant as possible, and a step of multiplexing a plurality of low bit rate connections into a same ATM connection having the thus scheduled ATM cell transmission times.

Figure to be published : Fig.1

FIG_1

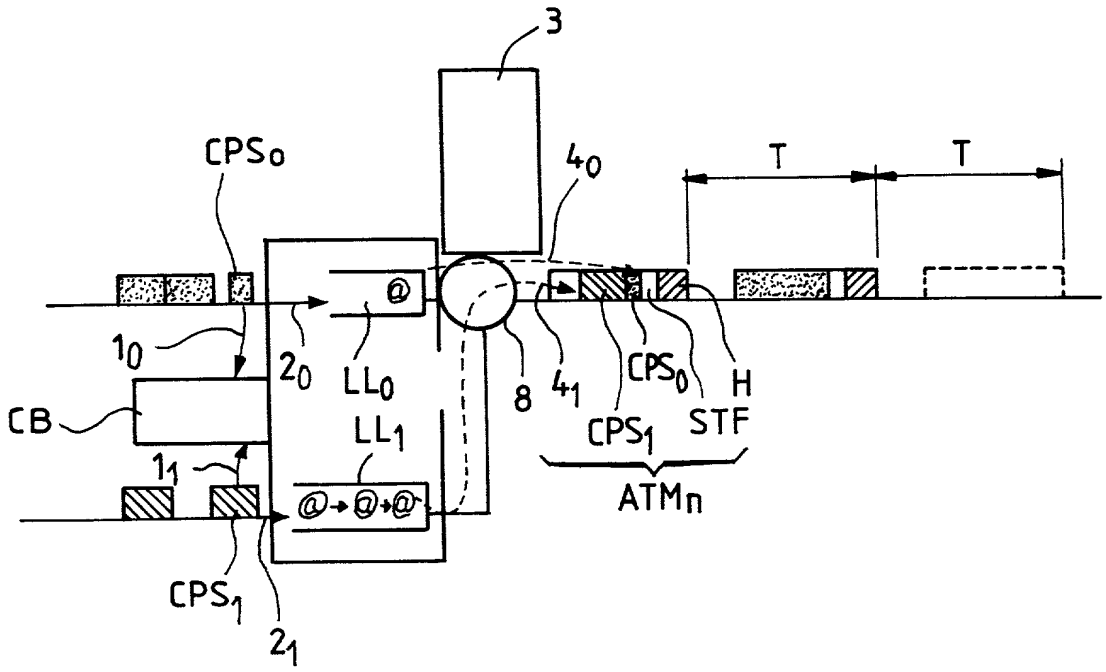
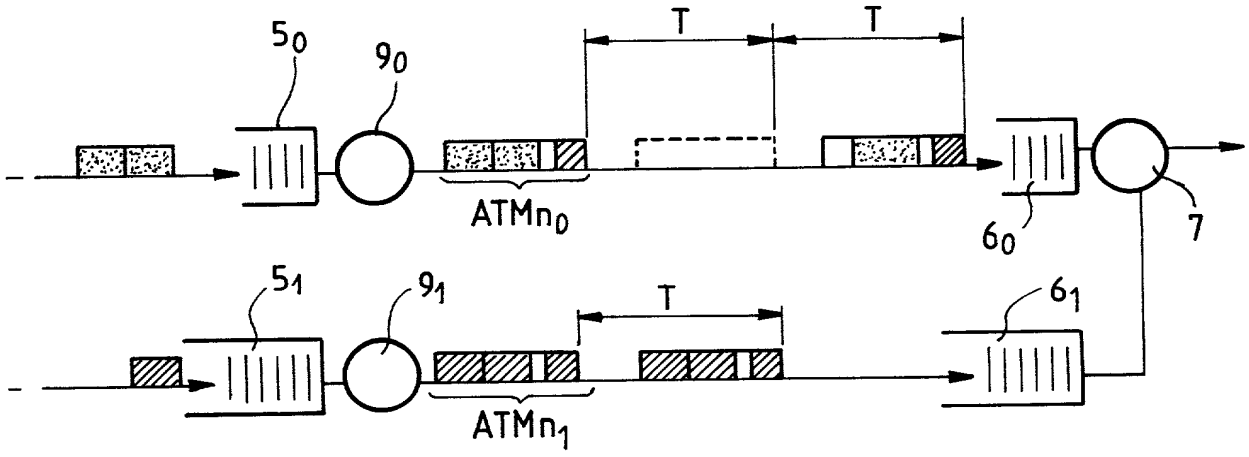

3
CPS0
40
T
T
10
20
LL0
@
8
41
CPS0
H
CB
LL1
CPS1
STF
11
@→@→@
ATMn
CPS1
21

FIG_2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Declaration and Power of Attorney for Patent Application

Déclaration et Pouvoirs pour Demande de Brevet

French Language Declaration

En tant que l'inventeur nommé ci-après, je déclare par le présent acte que:

As a below named inventor, I hereby declare that:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

My residence, post office address and citizenship are as stated next to my name.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention de la description identifiée par le numéro de référence

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention in the specification identified by Docket No.

102525/MA/RCD

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s) for which priority is claimed
Demande(s) de brevet étrangère(s) antérieure(s) dont la priorité est revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)
99 401 628.5	EUROPEAN PROCEDURE	30/June/1999

Prior foreign applications for which priority is not claimed
Demande(s) de brevet étrangères antérieure(s) dont la priorité n'est pas revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)

French Language Déclaration

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous.

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application No.) (No de demande)	(Filing Date) (Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.) (N0 de demande)	(Filing Date) (Date de dépôt)	(Status)(patented, pending, abandoned) (Statut)(breveté, en cours d'examen, abandonné)

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique; et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIRS: En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marques: (mentionner le nom et le numéro d'enregistrement).

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 32,765; and Robert M. Masters, Reg. No. 35,603.

Adresser toute correspondance à:

Send Correspondence to:
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W., Suite 800
Washington, D.C. 20037-3213

Nom complet de l'unique ou premier inventeur	Full name of sole or first inventor (First Middle Last) Claire BESSET-BATHIAS
Signature de l'inventeur Date	Inventor's signature Date C. Besset 06/08/99
Domicile	Residence 92200 NEUILLY SUR SEINE, France
Nationalité	Citizenship FRENCH
Adresse postale	Post Office Address 53 boulevard Victor Hugo 92200 NEUILLY SUR SEINE, FRANCE
Nom complet du second co-inventeur, le cas échéant	Full name of second joint inventor, if any (First Middle Last)
Signature du second inventeur Date	Second inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse postale	Post Office Address

(Fournir les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)